MEMORANDUM

TO: File

DATE: July 25, 1983

FROM: Jerry May

SUBJECT: Analysis of chat samples from Galena site

COPY: B. Bluck
D. Glanzman
N. Geitner
D. Nickelson

During the field sampling episode conducted at the Galena subsite to collect samples for metallurgical testing, it was found that several of the chat piles at the site, possibly, contained high concentrations of lead and zinc. These high concentrations were noted during field analysis using a portable X-ray fluorescence spectrometer (XRF). It was also observed that the chat piles were used, by local residents for recreation, by using them for a track for their motorcycles. This observation caused a concern for possible inhalation or ingestion of toxic metals from dust from the chat piles during these activities.

To substantiate these claims, samples from four chat piles were sent to a laboratory for analysis. Each of the four individual samples were split into fourths using a Jones Splitter. One of the fourths was prepared for total metal analysis of the bulk sample. One of the remaining fourths was dry screened at 80 mesh and the -80 mesh fraction and the +80 mesh fraction weighed then prepared for metals analysis. Each sample was analyzed for arsenic, cadmium, lead, and zinc, the results of the laboratory analysis are listed in Table 1.

As can be seen in Table 1, the lead is concentrated in the minus 80 mesh fraction of the sample for samples 01-02 and 07-01. For sample 01-02, the minus 80 mesh fraction represents 8.34 percent of the sample, but contains 42 percent of the lead. The same can be seen in sample 07-01 where 13.21 percent of the sample contains 35 percent of the lead. The same holds true for zinc in sample 07-01, where 13.21 percent of the sample contains 35 percent of the zinc. For sample 07-02, there is enough concentration of lead in the minus 80 fraction to raise it above the lead cutoff value off 1000 mg/kg.

From Table 1, it can be seen that the minus 80 mesh fraction of each sample contains sufficient quanity of either lead or zinc to cause concern over inhalation or ingestion.

The head grades for the bulk samples were back calculated using the grades and weights for the plus and minus 80 mesh fractions. Considering the heterogeneity of the samples, and that the bulk samples were analyzed from a different split, the results are very reasonable.

TABLE 1

ANALYSIS AND SCREEN DATA OF
CHAT SAMPLES FROM GALENA. KANSAS

SAMPLE NUMBER	SAMPLE DISCRIPTION	ARSENIC mg/kg	CADMIUM mg/kg	LEAD mg/kg	ZINC mg/kg	WEIGHT grams	WEIGHT %	FRACTION OF TOTAL LEAD	FRACTION OF TOTAL ZINC	CAL LEAD mg/kg	CAL ZINC mg/kg
01-02	Bulk	3.9	6.3	4580	1600	437.8				4565	1314
01-02	+80 mesh	4.3	5.4	2870	1360	401.3	91.66				
01-02	-80 mesh	8.8	2.4	23200	805	36.5	8.34	0.42	0.04		
06-01	Bulk	6.5	40.4	104	11200	286.3				442	10979
06-01	+80 mesh	7.6	39.8	455	10200	268.6	93.82				
06-01	-80 mesh	11.6	33.6	238	22800	17.7	6.18	0.14	0.13		
07-01	Bulk	5.6	38.2	1360	23800	281.5				1131	20034
07-01	+80 mesh	7.6	33.6	761	13400	244.3	86.79				
07-01	-80 mesh	9.8	34.5	3560	63600	37.2	13.21	0.35	0.35		
07-02	Bulk	5.1	9.2	887	2260	451.8				777	1775
07-02	+80 mesh	6.1	7.5	661	1760	437.1	96.75				
07-02	-80 mesh	6.2	8.4	4220	2230	14.7	3.25	0.15	0.03		

DRAFT

TECHNICAL MEMORANDUM

FIELD SAMPLING EPISODE CONDUCTED IN JUNE 1988 AT CHEROKEE COUNTY SUPERFUND SITE GALENA SUBSITE

SAMPLING OBJECTIVES

The objective of this sampling event was to collect mine waste rock samples and chat samples representative of the surface rock piles located at the Galena subsite. These rock samples are to be tested using metallurgical testing methods to provide data that will allow development of the most appropriate combination of design and operating parameters for the proposed conventional milling treatment unit. In addition, the metallurgical and chemical characteristics of the feed, tailing and mill water will be determined. The metallurgical tests are designed to establish optimum parameters for grind size, recovery, reagent types and consumption, and retention time in the flotation circuit.

The sampling approach had two specific objectives: 1) for metallurgical testing obtain two 5 gallon samples representing the high grade ore fraction and two 5 gallon samples representing the low grade ore fraction of the surface piles and, 2) for pilot testing, if necessary obtain approximately twenty 55 gallon drums of a reasonably representative site wide composited sample .

SAMPLING PROCEDURES AND DEVIATIONS FROM SAMPLING PLAN

The surface mine waste rock areas within the Galena Subsite have been divided into 8 zones, see Figure 1. The total volume of mine rock on the surface was estimated to be about 283,000 cubic yards. This volume of rock is distributed in many locations over 900 discontinuous acres.

The sampling event lasted five days, June 6 through 10, 1988. The first day was primarily spent obtaining the required equipment, identifying potential sampling areas, and confirming site access. Determination of specific sampling locations, based on XRF measurements and visual observations, and rock type and volume, was conducted during the second and third days.

A portable X-ray fluorescence spectrometer (XRF) was to be used to make semi-quanitative field measurements of the high and low grade materials. Calibration curves for the XRF's response to lead and zinc were established using laboratory prepared standards. A further check on the accuracy of the instruments response was made by re-analyzing mine waste samples collected in a previous sampling round which concentrations are known.

Originally, the XRF was to be used to determine which of the mine waste piles were high grade and which were low grade. After several attempts at taking field XRF measurements it was determined that the high grade material was too coarse grained for the XRF to give reliable data and that visual observation was more reliable in selecting high grade

materials. The XRF was then used to provide field analysis of the low grade fines and chat piles. Two 5 gallon pails were filled proportionally, by residual mineralization, from the 8 zones with mine rock that galena and sphalerite could be seen visually to represent the high grade fraction.

The portable XRF was to be used to collect semi-quanitative data from several chat piles to determine the approximate lead and zinc grade of the chat. After several piles had been analyzed it was found that the chat contained higher lead and zinc concentrations than expected, see Table 1. Along with the XRF data twelve samples of chat were collected for additional testing and laboratory analysis. Results from the field XRF analysis indicated that the chat with the highest lead and zinc values could be used as the low grade sample for metallurgical test work and a 5 gallon pail was collected. Each of the sampling points were staked and labeled with the zone and pile number. Table 1 provides the XRF chat data and several mine waste XRF data.

A field developed standard procedure for taking XRF readings from chat piles follows:

1) The chat piles to be sampled were selected on the basis of size.

2) A site was selected one third to two thirds up the side of the pile .

3) An XRF reading was taken at the surface of the pile.

4) A sample was taken from a hole dug approximately 2 feet into the pile.

5) An XRF reading was taken on the material from the bottom of the hole.

6) The process was repeated on each significant chat pile, as selected by (1) above.

A backhoe was to be used to develop trench samples in the rock piles to a vertical depth of 10 to 15 feet. Vertical horizons of varying mineral type were to be measured for depth and an XRF profile was to be taken for each test pit. Because of the heterogeneity and the size of the mine rock, (fine dust to rock 4 - 12 inches in diameter), it was not possible to use the XRF to estimate the grade of the pile.

The XRF instrument has a finite volume from which it can obtain information on the mineral content of a sample. If a sample is large and irregularly shaped (as is the case of most of the waste rock), results obtained using the XRF would only be indicative of the individual sample point, and not the selected rock or pile. A field decision was made to determine if the fine fraction of the piles contained high mineral values of lead and zinc with the assumption that the eroded and weathered fines represented a composite obtained from the entire pile.

A 3/4 inch grizzly screen was constructed in the field to separate the two fractions. The backhoe was used to sample rock piles from each of the 8 zones. The rock was screened at 3/4 inch and the plus 3/4 inch fraction was used to fill the 55 gallon drums. The minus 3/4 inch

fraction was analyzed using the XRF and the results are supplied in Table 2.

The field developed standard procedure for collecting test pit samples was done as follows:

1) Select a pile that was composed of mine rock. Piles were also selected on the basis of size and as to their representation of the particular area.

2) Set grizzly screen to the side of the area to excavated.

3) Use backhoe to scrape off top 2 feet of pile.

4) Use backhoe to scrape off next 2 feet and record description of material.

5) Excavate to a depth of 8-10 feet.

6) Using backhoe dump sample on top of grizzly.

7) Place fines, minus 3/4 inch, into sample bag.

8) Fill drum with coarse material.

9) Run XRF on coarser and fine fractions in sample bag and record data.

10) Place bag in drum and seal.

11) Repeat procedure twice for each zone.

Fifteen drums of mine rock were filled representing the 8 zones. A sixteenth drum was filled with chat from zone 7 (pile 7-1) that was thought to contained high levels of lead and zinc. All sixteen drums were placed on pallets behind the field office and covered with a tarp.

OBSERVATIONS

It was observed that the mine rock piles were very heterogeneous within the 8 zones. Within an individual pile there could be waste material from smelting or refining operations, debris from structures, old foundations and chat. Many of the areas were barren of galena while still having high levels of sphalerite. Other areas would be barren of both minerals. In general, it appeared that most of the mine rock piles had been reworked several times during previous mining and milling operations.

During excavation, a number of mine rock piles showed a high degree of open pore space (as much as 40%). This parameter was estimated in the field and varied considerably across the Galena subsite, dropping to as low as 15%. This observation will have a major effect on the volume/mass calculations in determining the total mine waste rock tonnage.

REFERENCES

1. Groundwater and Surface Water Operable Unit Feasibility Study Galena Subsite, Cherokee County Site, Kansas February 26, 1988

TABLE 1

Cherokee County - Galena Site
XRF Analysis of mine waste and chat

DATE	PILE NUMBER	WASTE TYPE	DEPTH OF SAMPLE	Zn INDEX NUMBER	Zn PPM	Pb INDEX NUMBER	Pb PPM	NOTE
JUNE 7	01-01	CHAT	SURFACE	0.28	1396	0.72	824	
			-2 FT	0.32	1924	0.78	1226	
			-2 FT	0.28	1396	0.82	1491	
	01-02	CHAT	SURFACE	0.57	2584	1.07	2169	
			-1 FT	0.41	2112	1.91	5797	
			-1.5 FT	0.50	2056	1.71	7457	
	01-03	CHAT	SURFACE	0.24	868	0.71	757	
			SURFACE	0.26	1132	0.79	1293	REPEAT
			SURFACE	0.26	1132	0.80	1360	REPEAT
			SURFACE	0.23	736	0.69	622	REPEAT
			SURFACE	0.25	1000	0.65	555	REPEAT
			SURFACE	0.28	1396	0.75	1025	REPEAT
			-2 FT	0.25	1000	0.73	891	
	01-04	CHAT	SURFACE	0.27	1264	0.80	1360	
			-1.5 FT	0.29	1528	1.10	3370	
				0.32	1924	1.02	2834	REPEAT
	01-05	CHAT	SURFACE	0.30	1660	0.94	2298	
			-1 FT	0.37	2584	1.37	5179	
			-2 TF	0.28	1396	0.94	2299	
	01-06	CHAT	SURFACE	0.28	1396	1.01	2767	
			-2 FT	0.24	868	0.79	1293	
	01-07	FINES FROM COARSE ROCK PILE	FINES	1.07	11824	2.07	9869	
				1.00	10900	1.98	9266	REPEAT
			COARSE	0.51	4432	1.27	4509	
				0.52	4564	1.27	4509	REPEAT
	01-08	FINES FROM COARSE ROCK PILE	SURFACE	0.74	7468	1.61	6787	
			-2 FT	0.72	7204	1.69	7823	
	06-01	CHAT	SURFACE	1.23	13936	0.77	1159	
			-2 FT	0.97	10504	1.09	3303	
	06-02	CHAT	SURFACE	0.63	6016	0.94	2299	
			-1.5 FT	1.44	16708	1.62	6854	
	06-03	CHAT	SURFACE	0.33	2056	0.95	2265	
			-2 FT	0.38	2716	1.00	2700	
	06-04	CHAT	SURFACE	0.41	3112	1.09	3307	
			-2 FT	0.44	3508	1.00	2700	

	06-05		CHAT	SURFACE	0.63	5016	0.85	1695
				-2 FT	0.83	6636	1.00	2000
	06-06		CHAT	SURFACE	0.59	4720	0.85	1695
				-2 FT	0.67	5344	0.81	1427
	05-01		CHAT	SURFACE	0.77	7864	0.77	1159
				-2 FT	0.85	8920	1.14	2968
	05-02		CHAT	SURFACE	0.29	1828	0.85	1695
				-2 FT	0.47	3076	0.84	1628
	05-03		CHAT	SURFACE	0.33	2096	0.87	1829
				-2 FT	0.39	2848	0.71	757
	05-04		CHAT	SURFACE	0.64	4828	0.96	2432
				-2 FT	0.39	2348	0.88	1896
	05-05		CHAT	SURFACE	0.29	1528	0.81	1427
				-1.5 FT	0.35	2220	0.75	1025
	05-06		CHAT	SURFACE	0.30	1660	0.80	1360
				-2 FT	0.27	1264	0.73	891
	07-01		CHAT	SURFACE	0.94	10108	0.87	1829
				-1.5 FT	3.38	42316	1.21	4107
				-1.5 FT	3.65	45880	1.25	4375 REPEAT
				-1.5 FT	2.32	28324	1.53	6251 NEW SPOT
	07-02		CHAT	SURFACE	0.25	1000	0.82	1494
				-2 FT	0.32	1924	0.85	1695
	07-03		CHAT	SURFACE	0.28	1396	0.87	1829
				-2 FT	0.32	1924	1.10	3070
					0.28	1396	1.12	3504 REPEAT
		8" ROCK WITH VISIBLE SPHALERITE			10.59	137483	2.45	12415
	07-04		CHAT	SURFACE	2.16	26212	0.97	2499
				-2 FT	6.26	80302	1.04	2968
	07-05		CHAT	SURFACE	0.39	2848	0.76	1092
				-2 FT	4.35	55120	1.00	2701
					4.34	61583	1.01	2767 REPEAT
					4.02	54724	0.94	2298 REPEAT
	07-06		CHAT	SURFACE	0.32	2056	0.84	1628
				-2 FT	0.31	1792	0.81	1427
	07-07		CHAT	SURFACE	0.29	1528	0.72	824
				-2 FT	0.28	1396	0.71	757
JUNE 8	08-01		CHAT	SURFACE	0.30	1660	0.71	757
				-2 FT	0.25	1000	0.74	958

03-12	CHAT	SURFACE	0.24	366	0.67	489
		-1.5 FT	0.25	1000	0.99	623
02-01	CHAT	SURFACE	0.25	1000	0.88	1395
		-2 FT	0.25	1000	0.94	2293
02-02	CHAT	SURFACE	0.24	2185	1.17	3305
		-2 FT	0.25	2320	1.22	4174
02-03	CHAT	SURFACE	0.42	3244	0.81	1427
		-1.5 FT	0.22	604	0.79	893

TABLE 2

CHEROKEE COUNTY SAMPLE COLLECTION
SALEMA SITE
SCREENED SAMPLES OF WASTE PILES

DATE	SAMPLE TYPE	PILE NUMBER	ZINC INDEX	PPM ZINC	LEAD INDEX	PPM LEAD	NOTES
JUNE 9,1988	FINE	P1-1	0.80	8260	1.60	6921	
	FINE		0.72	7234	1.78	7926	
	COARSE		0.45	3376	1.07	4519	
	FINE	P1-2	0.78	7995	1.14	4978	
	FINE		0.47	3904	1.19	5003	
	COARSE		0.86	9052	1.02	4844	
	FINE	P2-1	1.03	11956	1.87	8529	
	FINE		0.93	10676	1.85	8595	
	FINE	P2-2	0.71	7072	1.47	5849	
	FINE		0.54	4823	1.65	7055	
	FINE	P3-1	0.30	1660	0.79	1290	
	FINE		0.34	2138	0.75	1025	
	FINE	P3-2	0.39	2848	0.82	1494	
	FINE		0.49	4168	0.94	2298	
	COARSE	P4-1	0.37	2584	1.44	5548	
	FINE		0.39	2848	1.4	5380	
	FINE	P4-2	0.27	1264	0.98	2566	
	FINE		0.29	1529	1.16	3772	
	COARSE	P7-1	0.40	2980	1.35	5045	
	FINE		0.48	4036	1.57	6519	
	FINE	P7-2	0.96	10372	2.51	12817	
	COARSE		0.41	3112	1.22	4174	
JUNE 10, 1988	COARSE	P8-1	0.83	9016	1.39	8662	
	FINE		0.92	9844	0.91	2097	
	COARSE		0.79	8128	0.94	2298	
	COARSE	P5-1	0.23	776	0.69	620	
	COARSE		0.26	1132	0.74	958	
	COARSE	P5-2	0.36	2452	0.86	1762	
	FINE		0.61	5752	0.79	1290	
	FINE	P6-1	0.89	9448	4.57	26519	
	FINE		1.06	11692	3.81	21527	
	FINE	P6-2	0.41	3112	0.85	1595	
	FINE		0.54	4823	0.95	2265	
	COARSE		0.34	2138	0.95	2265	

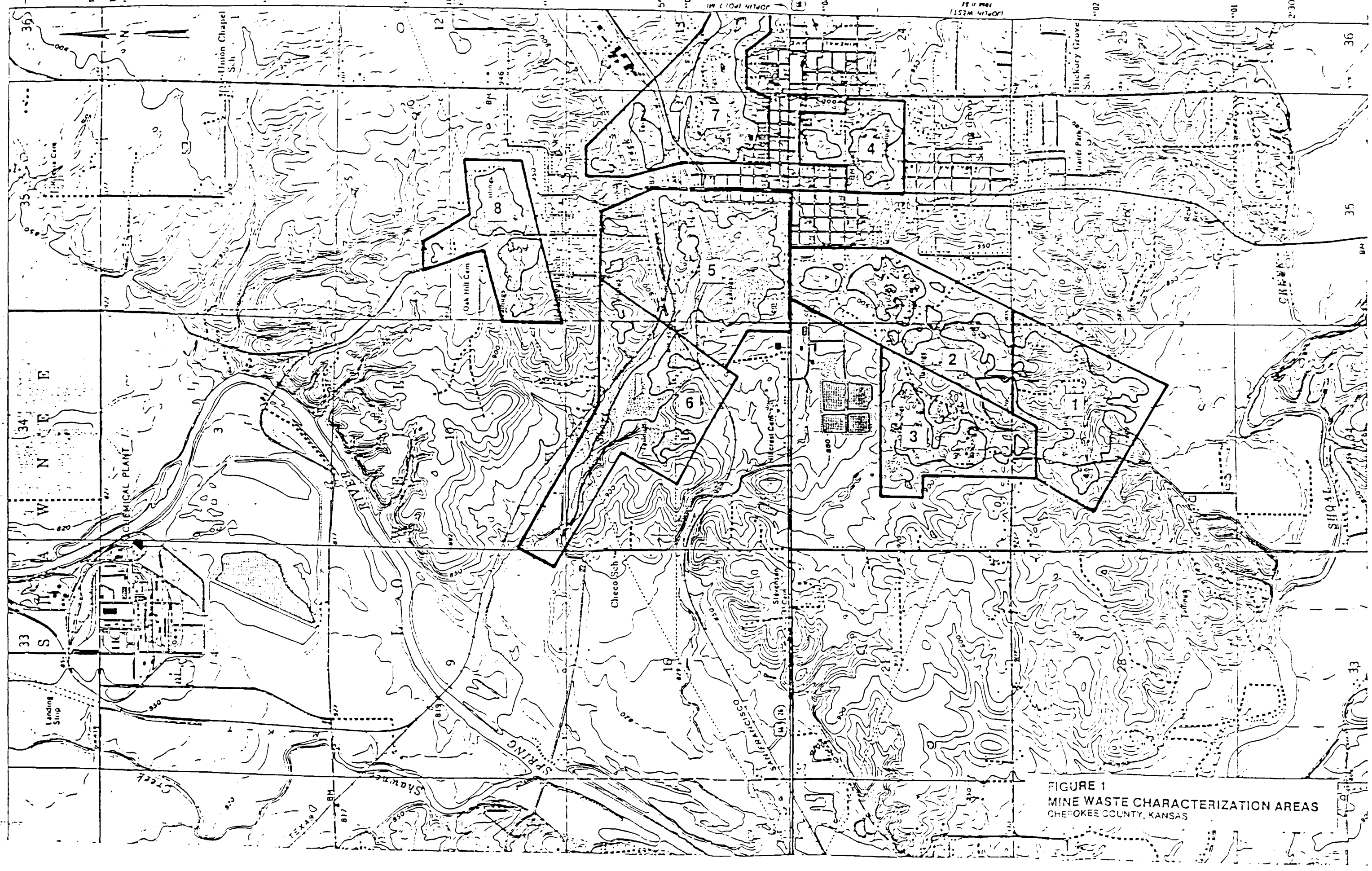


FIGURE 1
MINE WASTE CHARACTERIZATION AREAS
CHEROKEE COUNTY, KANSAS

DRAFT

WORK PLAN

PRP ALTERNATIVE REVIEW AND INVESTIGATION

FOR THE GALENA SUBSITE

CHEROKEE COUNTY SITE

INTRODUCTION

A technical meeting was held with EPA, their contractor CHOM Hill, and the principal PRP's and their consultants, at Galena Kansas on June 20 and 21, 1988. The purpose of this meeting was to discuss EPA's preferred alternative for remediation at the Galena subsite. This alternative is treatment of the high grade mine waste by conventional milling, for recovery of lead, zinc and cadmium, and disposal of the clean tailing in the mine voids.

At the meeting the PRPs proposed an alternative to the EPA's chosen alternative. This would be to place the coarse mine waste rock, containing the majority of the metal contaminants, back into the mine voids and place chat material, presuming to contain lower amounts of metal contaminants, over the waste rock and re-contour the surface of the disturbed site area.

GOALS AND OBJECTIVES

The objective of this work is to determine through laboratory test work and computer modeling of the results, the effect the PRP's alternative would have on increasing the metal contaminant level in the ground water within the Galena subsite. Some of the mine waste material when placed into the mine voids will come into contact with ground water immediately, other material will come into contact with water only as a result of precipitation or surface water infiltration. Because of these different scenarios, two different leach testing methods will be considered. The proposed schedule for this activity and the estimated cost for this workplan are presented in Attachment 1 and 2.

DELIVERABLES

Project deliverables will consist of a final report describing the leach testing results, laboratory analysis, and the results of the computer modeling.

LABORATORY LEACH TESTS

Leach tests will be preformed on mine waste rock from four areas, 1, 3, 4, and 7, and from chat samples from areas 1 and 7. Since the chat will be used as surface cover and will not come into contact with groundwater, only leach method #1 will be applied to the chat. The mine waste rock may or may not come into contact with the groundwater,

therefore, both leach methods, #1 and #2, will be applied to the waste rock. Samples used in the leach test may come from the samples collected during the June, 1983 field activities when samples were collected for the metallurgical test work, or new samples may be collected, if necessary.

Two leach method techniques will be employed and are described below:

Method 1, simulation of surface water infiltration, by precipitation or stream water.

Approximately 100 pounds of mine waste rock, crushed to minus one inch, will be placed into a ten inch diameter column (figure 1). Chat samples will not need to be crushed.

The column will be constructed with a device to drip water in an evenly distributed manner over the waste rock, and a recovery device will remove the water from the bottom of the column.

The column will be flooded with distilled water, pH 6-7, and allowed to sit for one hour. Then the water will be drained from the column. Measure and record the volume - time relationship in sufficient detail to document the yield curve (maximum time units of 5 minutes). Measure and record the specific conductance, pH, and temperature of the sample saved for analysis. The column will be sealed and allow to stand for two days.

After two days, 1287 cc's of distilled water, pH 6-7, will be evenly distributed at the rate of 10.7 cc's per minute and allowed to percolate through the waste rock within the column, removed at the bottom. Measure and record the volume time - relationship in sufficient detail to document the yield curve (maximum time units of 5 minutes). Measure and record the specific conductance, pH, and temperature of the sample saved for analysis.

This procedure will be repeated at the 5th, 9th, 15th, and 28th day. The column will be kept sealed between leaching days.

This will represent surface infiltration from a two hour, one inch rainfall, at random days on the Galena subsite.

Method 2, simulation of mine waste rock in a saturated ground water zone.

Approximately 100 pounds of mine waste rock, crushed to minus one inch, will be placed into a ten inch diameter column (figure 2).

The column will be constructed with a inlet at the bottom and an outlet at the top of the column. The inlet tube will be connected to a reservoir large enough to hold 1500 cc's of distilled water, pH 6-7. The outlet will feed into a flask large enough to hold 1500 cc's of water. The outlet line will be fitted with a vacuum break to prevent syphoning.

The reservoir height will be adjusted to maintain flooding of the waste

rock contained in the column.

After the column is flooded it will be allowed to stand for two days. After two days 1287 cc's of water will be added to the reservoir and allowed to percolate through the rock from the bottom at a rate of 10.7 cc's per minute. Water will be collected from the overflow at the same rate. Maintain and record the head required to produce a flow through the column at a rate of 10.7 cc per minute. Collect the total overflow for a sample. Record the total time and volume of sample produced. Save the total sample for analysis after recording the specific conductance, pH, and temperature.

The procedure will be repeated a the 5th, 9th, 15th, and 28th days. After the sample for the 28th day is collected the solution will be drained from the column, the column sealed and allowed to stand for 7 days. After the 7 days the column will be flooded at a rate of 10.7 cc's per minute until 1287 cc's of water is collected at the overflow.

All samples will be saved for analysis. Distilled water with a adjusted pH between 6 and 7 will be used in the test work. Distilled water pH will be adjusted with sulfuric acid, if necessary. Temperature is expected to be maintained at 25 +/- 3 oC throughout the tests.

ANALYTICAL TESTING

Mine waste rock and chat samples used in the test work will be analyzed for metal contaminants. A one pound sample will be split from the column testing sample, using a Jones splitter, ground to minus 100 mesh, and analyzed for the following metals.

- LEAD
- ZINC
- CADMIUM

All leachate samples recovered from the test work will be analyzed for the following parameters:

- LEAD
- ZINC
- CADMIUM
- pH
- SPECIFIC CONDUCTIVITY
- SO4

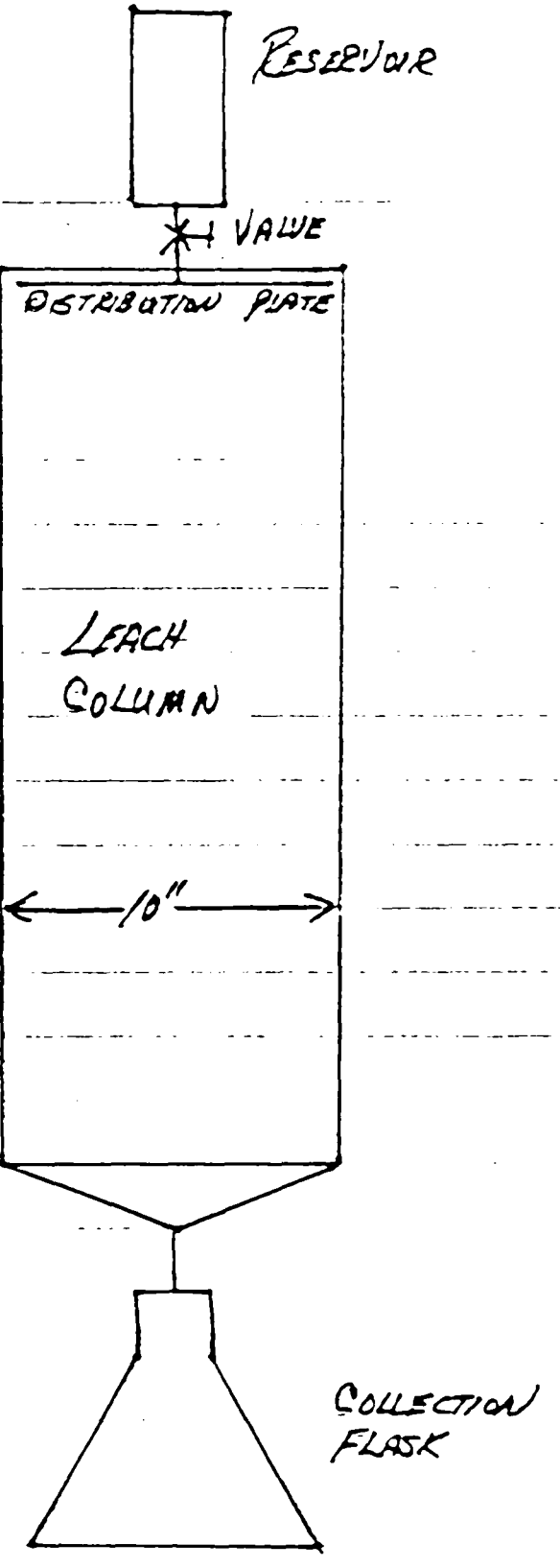
COMPUTER MODELING

The Prickett Lonnquist finite differences computer model developed for the Groundwater/Surface Water Operable Unit Feasibility Study will use the above data as input. The model will be use to determine the geohydrologic impact of placing the existing surface mine wastes into the mine workings without treatment. The model will address the potential changes in groundwater flows and average annual discharge through the mine workings to the surface water. Furthermore the

modeling will consider a case with stream diversion and one without.

The locations, volumes, and areal extent of mine wastes placed in the workings will be estimated and prioritized into area's that contain mine wastes that fail the EP Toxicity test within residential sections of the City. The priority will involve a strategic location of placed waste volume to restrict and slow the groundwater movement through the mine workings. The areal coverage estimate will result in reducing a proportional area of subsurface mine wastes exposed to oxidation and metal transport by the groundwater.

The calculated discharges will be combined with the chemical data to calculate a mass load of metal to the surface water as a potential annual mass load both with and without surface water diversion. The mass load will be calculated for zinc and cadmium. Lead will be considered for mass load calculation depending on the results of the water analysis. The mass load will be treated in a fashion similar to the OUFS i.e. anticipated impact on, and monitoring by sampling, surface water. Short term, precipitation events mass loads will be estimated. Long term decreased in metal transport will be considered and may be estimated depending on the results of the tests.



URE 1. SURFACE WATER INFILTRATION

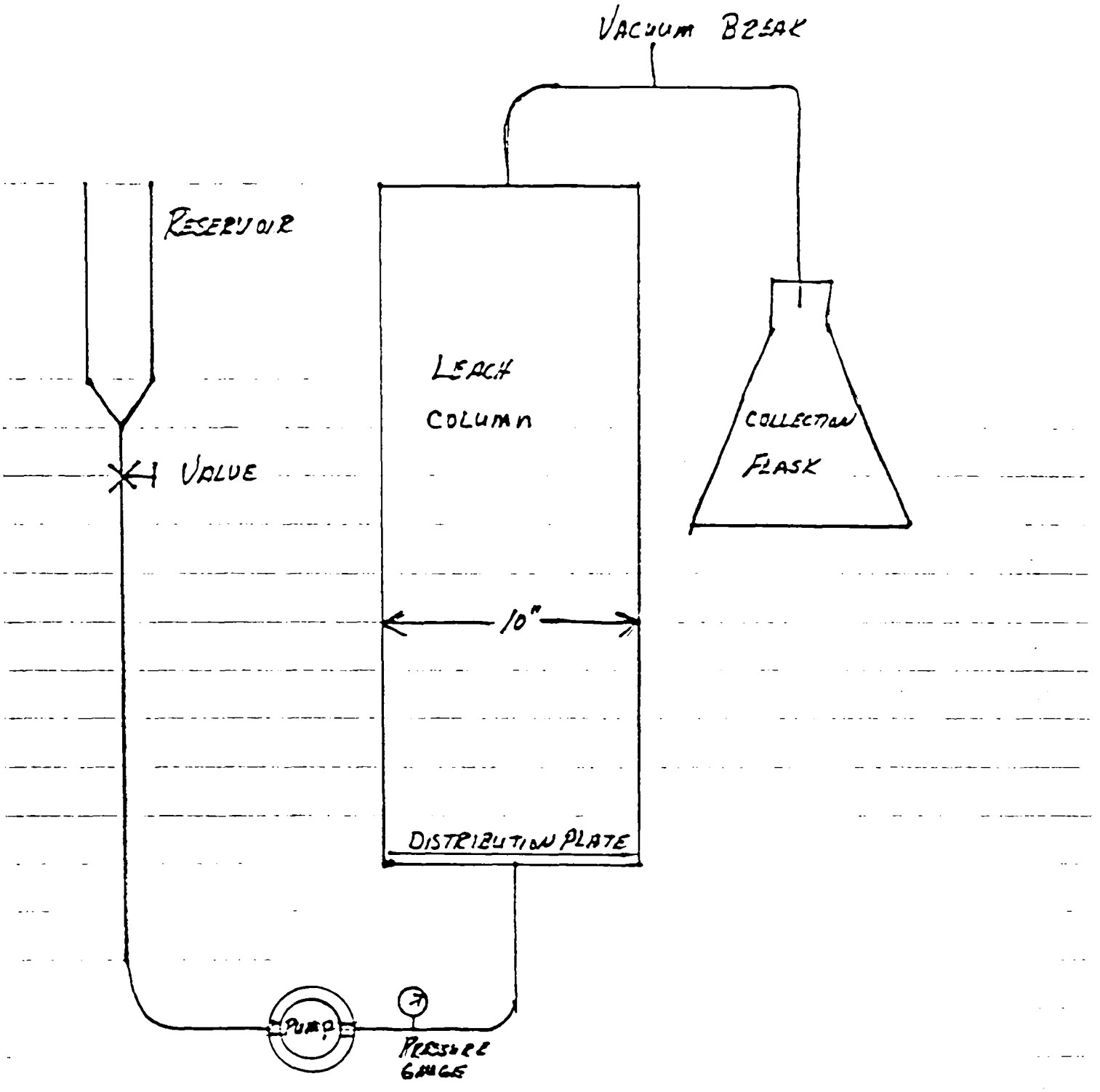


FIGURE 2. GROUND WATER SIMULATION

ME/FIRM/GRADE/DISC	PROJECT TO DATE	07/88	08/88	09/88	10/88	11/88	12/88	Q1-89	Q2-89	Q3-89	Q4-89	BEYOND	ESTIMATED AT COMPLETE HOURS	ESTIMATED AT COMPLETE COST
Galena Site - PRP Alternative Evaluation														
ITNER N M CH P4 66	0	0	4	8	0	0	0	0	0	0	0	0	12	342
UCK W V CH P4 33	0	0	4	8	0	0	0	0	0	0	0	0	12	342
ANZMAN R K CH P4 65	0	0	8	32	0	0	0	0	0	0	0	0	40	1141
Y G L CH P3 33	0	0	16	40	0	0	0	0	0	0	0	0	56	1137
CKELSON D F CH P2 31	0	0	16	40	0	0	0	0	0	0	0	0	56	955
NGE A L CH P2 65	0	0	0	16	0	0	0	0	0	0	0	0	16	273
CH PUBLICATIO CH T2 92	0	0	0	12	0	0	0	0	0	0	0	0	12	173
APHICS CH T2 96	0	0	0	8	0	0	0	0	0	0	0	0	8	119
KIN A R CH P1 65	0	0	0	8	0	0	0	0	0	0	0	0	8	116
RD PROCESSING CH O 98	0	0	4	16	0	0	0	0	0	0	0	0	20	191
rofessional Hours Total	0	0	48	172	0	0	0	0	0	0	0	0	220	4606
ffice Hours Total	0	0	4	16	0	0	0	0	0	0	0	0	20	191
otal Hours	0	0	52	188	0	0	0	0	0	0	0	0	240	
otal Labor Cost	0	0	1093	3704	0	0	0	0	0	0	0	0		4797
udgeted Prof. Hours													0	
ariance													-220	
													Unrecorded Cost $	
DC Miscellane CH	0	0	100	400	0	0	0	0	0	0	0	0	0	500
DC Postage & CH	0	0	200	100	0	0	0	0	0	0	0	0	0	300
DC Reprograph CH	0	0	25	200	0	0	0	0	0	0	0	0	0	225
DC Telephone CH	0	0	50	100	0	0	0	0	0	0	0	0	0	150
RV Air Transp CH	0	0	800	0	0	0	0	0	0	0	0	0	0	800
RV Ground Tra CH	0	0	120	0	0	0	0	0	0	0	0	0	0	120
RV Miscellane CH	0	0	100	0	0	0	0	0	0	0	0	0	0	100
RV Meals & Lo CH	0	0	300	0	0	0	0	0	0	0	0	0	0	300
UB HSI Modeli CH	0	0	0	7500	0	0	0	0	0	0	0	0	0	7500
UB Lab Testwo CH	0	0	8197	15603	0	0	0	0	0	0	0	0	0	23800
tal Expense	0	0	9892	23983	0	0	0	0	0	0	0	0	0	33875
ndirects CH	0													8008
ees CH	0													3099
Total Cost	0	0	13685	36090	0	0	0	0	0	0	0	0	0	49779
Budget														0
Variance														-49779

	Hours	Cost
Task Total	240	49779

ternal Projects, Tasks, Milestones Included.